IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Mehmet Hancer	
Appln. No.	:	10/700,031	Group Art Unit: 2627
Filed	:	November 3, 2003	
Title	:	ENCAPSULANT FOR A DISC DRIVE COMPONENT	Examiner: David Donald Davis
Docket No.	:	169.12-0621	

DECLARATION OF MEHMET HANCER UNDER 37 C.F.R. § 1.131

Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SENT VIA EXPRESS MAIL
Express Mail No.:

I, Mehmet Hancer, state:

1. I am a co-inventor, with Marsha A. Huha, John S. Wright and Lee Walter, of U.S. Pat. Appln. No. 10/700,031, filed Nov. 3, 2003 (the present application).

2. At the time the present invention (the subject matter of the present application) was conceived and reduced to practice, all four inventors were employees of Seagate. All four inventors were part of a research and development effort to develop improved actuation systems for positioning sliders. Rights in the present invention are assigned to Seagate Technology LLC.

3. The present application discloses and claims an improved actuation system for positioning a slider carrying a transducing head. The improvement is an encapsulant comprised of a self assembled monolayer with a self limiting thickness of one layer of a molecule, which covers a surface of a component selected from the group consisting of the microactuator, the slider, a disc spacer, surface mount components on a printed circuit card assembly, and ceramic components of the actuation system.

4. The present invention was conceived prior to May 8, 2003, which is the filing date of Feng et al., U.S. Pat. Appln. No. 10/434,949. The inventors pursued the present invention with diligence from conception through reduction to practice.

5. Exhibit 1 is an email I sent to Lee Walter. This email includes Lee Walter, Lance Stover (my supervisor at the time), Zine Boutaghou, and myself, and identifies each of us with Seagate. This email is dated prior to the filing date of the Feng application.

6. In Exhibit 1, I tell Lee Walter that I had conceived of an improved slider encapsulant comprising a self assembled monolayer. To my knowledge, this was a first of a kind application in Seagate for a slider coating. After some preliminary tests, I was thinking of writing a new patent disclosure (for the present application), and I asked Lee Walter for a copy of his recent patent disclosure, which was embodied in a patent application by Marsha Huha, John S. Wright and Lee Walter, and is now U.S. Pat. No. 6,930,861.

7. In Exhibit 1, I identify octadecyltrichlorosilane (OTS) as a self assembled monolayer (SAM) chemistry. I identify specific superior properties of OTS, including controllable thickness, formation of a close-packed dense film that does not require electron beam or UV curing, heat and chemical resistance, excellent tribological properties, and easy degradation (removal) by selective UV treatment. I also identify possible advantages, including potential elimination of the use of Seawax, elimination of lubricant pickup from recording media and lubricant collection at cavities on the slider body, prevention of particle shedding and of the slider being "sucked" by the media, and the potential to facilitate smoother ramping due to low surface energy.

8. Exhibits 2 and 3 are highlight reports I prepared for Lance Stover, my supervisor at the time. The highlights are approximately biweekly progress reports. Each highlight is numbered by fiscal week, which identifies the report by calendar date. These two highlights are dated prior to the filing date of the Feng application. As with each of the Exhibits herein, the fiscal week and other specific dates have been redacted. Information not related to the present application has also been redacted.

9. In Exhibits 2 and 3, I report that I would be studying selective encapsulation of slider bodies using thin organic films. Selective encapsulation was to be achieved by creating a cross-linked film bonded to a substrate, unlike mobile films commonly used for lubrication purposes. Selective encapsulation was expected to prevent particle release, and to protect the edges and corners of the head.

10. In Exhibits 2 and 3, I also report that I was ordering octadecyltrichlorosilane (OTS) from Sigma-Aldrich. I report additional advantages of OTS, including formation of a close-packed dense film with a "pretty much self-limiting" thickness of maximum about 30 angstroms (30 Å), which does not require curing. I identify OTS as a choice of encapsulating agent due to superior tribological properties, thermal and chemical stability (to temperatures of 500–700 K), and selective degradation using UV. OTS allows the entire slider body to be encapsulated, or for etching away the OTS on the air-bearing surface (ABS).

11. Exhibits 4 and 5 are also highlight reports that I prepared, and are also dated prior to the filing date of the Feng application. In Exhibits 4 and 5, I report that I was waiting on internal approval for the encapsulant chemistries, and for the OTS order from Sigma-Aldrich. I also report that FT/IR (Fourier transform/infrared) specular reflectance equipment had been ordered to test the OTS coatings. I reiterate that self-assembled monolayer (SAM) coatings do not require curing, but make dense-packed cross-linked monolayer films. I also report further potential advantages, including the fact that OTS may or may not adsorb onto a diamond-like coating (DLC), but could easily be etched away using UV treatment, and that SAM technology could be used as a protective head overcoat.

12. Exhibits 6–9 are also highlight reports that I prepared, dated prior to the filing date of the Feng application. In Exhibits 6–9, I report that my group started encapsulating 0.5″ × 0.5″ (half-inch by half-inch) Aluminum-Titanium-Carbon (Al_2O_3 + TiC) alloy coupons with an OTS self-assembled monolayer (SAM). My group optimized the SAM encapsulation process for particular solvents, with particular adsorption times. My group performed rinsing tests to be sure the OTS really adsorbed onto the surface, and water contact angle results show that an OTS overcoat was a better moisture barrier than a diamond-like coating (DLC).

13. AlTiC coupons are used for encapsulation studies because typically about 90-95% of the slider body is AlTiC. The difference between an AlTiC coupon and a slider is that the slider also has an embedded transducer head. (See Exhibit 14.)

14. After the AlTiC coupons had been encapsulated, I turned my attention to encapsulating actual sliders. Prior to the filing date of the present application, my group encapsulated actual slider bodies, and tested the slider bodies to confirm that they performed in actual disc drives. My group also performed tests to confirm advantages of the present invention, via elipsometry studies to understand film quality and confirm that moisture affects SAM formation, FTIR tests to show selective encapsulation, and media lubricant contact angle tests to show diminished lubricant pickup.

15. Exhibit 10 is a letter from Gayle Bush, a patent attorney at Kinney & Lange, to Paul Dietz, a patent attorney in the legal department at Seagate. The Exhibit identifies each of these parties, and indicates their association with Kinney & Lange and Seagate, respectively. This Exhibit is dated prior to the filing date of the present application.

16. After the AlTiC coupons had been encapsulated, I also turned my attention to filing the present patent application. I disclosed the substance of the present invention to the legal department at Seagate, including Paul Dietz. As shown in Exhibit 10, Paul Dietz asked Gayle Bush at Kinney & Lange to file the present application.

17. Exhibit 11 is an email reply to Gayle Bush, from Jackie Stadt in the legal department at Seagate. This Exhibit is also dated prior to the filing date of the present application. Exhibit 11 states that the inventors on the present application are Marsha Huha, John Wright, Lee Walter and me.

18. Exhibit 12 is an invention disclosure for the present invention. The disclosure is in the form of an email from me to Gayle Bush, at Kinney & Lange, with a copy to Paul Dietz, at Seagate. Exhibit 12 identifies the parties and their associations with Kinney & Lange and Seagate respectively. The disclosure is dated prior to the filing date of the present application.

19. In Exhibit 12, I disclose that the present application is directed to the same invention that was conceived; namely, an improved encapsulant for a slider body, using a self assembled monolayer (SAM) for the encapsulant. I disclose SAM encapsulants of organosilane chemistries including octadecyltrichlorosilane (OTS), octadecyldimethylchlorosilane, butyltrichlorosilane, perfluorodecyltrichloro-silane,

alkylsiloxane, alkyl and perfluoroalkyl-trichlorosilane, dichlorosilane, alkene and alkyl ethoxy silanes, octadecyltriethoxysilane, alkylaminosilanes, and alkanethiols. I also disclose that n-octadecene, which is not an organosilane, should also be included.

20. In Exhibit 12, I also disclose that the present invention has advantages that were reported when the invention was conceived. These advantages include a self-limiting thickness of one layer of a molecule, which does not require curing, and that dense packed SAM molecules naturally cross-link to an AlTiC substrate. I also disclose that the specific SAM chemistries in the present invention make excellent thin barrier films against moisture, prevent particle shedding and accumulation, prevent media lubricant pickup, and preferentially stick to (encapsulate) AlTiC surfaces, not diamond-like coatings (DLCs). This makes the disclosed OTS chemistries excellent candidates for a slider body coating with reduced stiction/friction, and without creating head media separation problems.

21. Exhibits 13 and 14 are emails I wrote to Gayle Bush to answer her questions about the present invention and the present application. These emails indicate my address at Seagate, and the address of Gayle Bush at Kinney & Lange. These emails are each dated prior to the application date of the present invention.

22. In Exhibit 13, I discuss specific solvent SAM chemistries including OTS, and disclose specific solvent compositions and chemical vapor deposition (CVD) processes for creating the SAM coating. I also provide an image of a computer hard disc slider, with the air-bearing surface (ABS) up, coated by a SAM thin film.

23. In Exhibit 14, I explain to Gayle that a non-encapsulated slider surface is essentially AlTiC, and that the SAM encapsulant selectively lowers the surface energy. This is a sealing event, making sliders less amendable to external particles, contaminants and moisture. The SAM also works like a lubrication layer, making the slider fly better over media with improved stiction and friction, without head media separation problems because the SAM encapsulant is selective, and does not stick to the diamond-like coating (DLC).

24. In summary, the present application is directed toward an improved actuator with a self assembled monolayer (SAM) encapsulant. The invention was conceived prior to

the filing date of the Feng application, and was diligently pursued through reduction to practice by building and encapsulating sliders, and then by filing the present application.

25. At the time of conception, specific SAM chemistries including OTS were identified, and the invention was reduced to practice using the identified chemistries. At the time of conception, specific advantages of the SAM encapsulant were also identified, and these advantages were demonstrated on actual, working slider bodies prior to the filing date of the present application.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statement were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Mehmet Hancer

Date: October 4, 2007

REDACTED

****

----- Forwarded by Mehmet Hancer/Seagate on [redacted] -----

Mehmet
Hancer/Seagate
952 402 7737
To
Lee Walter/Seagate
cc
[redacted]
Zine E Boutaghou/Seagate@Seagate,
Lance E Stover/Seagate@Seagate
Subject
slider encapsulation using OTS

Hi Lee:
As you know I have other chemistries independent of your PFPE's to test for encapsulation.
Octadecyltrichlorosilane(C8 to C18) self assembled monalayers is the chemistry which I will also be testing. OTS may have sperior properties such as thickness more controllable, close packed dense film, does not require e beam or UV curing, heat and chemical resistance, excellent tribological properties proven in MEMS etc. Besides the OTS thin film can be easly degraded (removed) by UV treatment selectively.
I guess this application is a first of a kind in Segate for slider coating.
The use of OTS may also eliminate the use of Seawax

PETITIONER'S
EXHIBIT
1
PENGAD · Bayonne, N.J.

as sliders OTS coated before shipped to HGA. This may also eliminate the slider picking lub from media and lub collection at the cavity and prevent slider from sucked by media. Additionally facilitate smoother L/UL ramping (low surface energy) and may be prevent particle shedding.

I am even thinking to write a disclosure after having some preliminary test.
Can I also have your recent patent disclosure's text portion on Slider Particle Encapsulation
Could you also update me the status of MEMS e beam or whether I can use one of your technician to use in other machine to do e beam portion of PFPE encapsulation.

Regards,
Mehmet

Seagate

Information, the way you want it

UPDATE, [redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW** [redacted]

ACCOMPLISHMENTS / STATUS
CRITICAL ISSUES
IMPORTANT RESULTS / DATA
NEW FINDINGS / NEW PROJECTS

DETAILS

- **Organic (resist and adhesives) Contaminant Cleaning:**

REDACTED

- **Slider Body Selective Encapsulation**: As reported last week, possibilities of selectively encapsulating slider body using thin organic films will be studied. It is expected that selective encapsulation will prevent particles releasing from head as well as protect the edges and corners of head, which are more prone to particle releases during contact and intermittent contact events (L/UL, seek, skip, write). It should be noted that effective encapsulation can only be achieved by creating a cross linked film bonded to a substrate surface unlike mobile films commonly used for lubrication purposes. It is also possible to create multilayer films of which first layer is selectively bonded. Initially flat AlTiC, and DLC coated AlTiC coupons (0.5x0.5") will be dip coated using tetraol (at 1% and 2% concentrations) followed by different e-beam curing dosage. (Start FW0332). Thin film thickness and chemistry will be characterized by ellipsometry, FTIR/grazing angle, and contact angle measurements. Later, tests will be repeated using actual slider samples and analyze for particle release using L/UL testing (by J L Brand), shaker (particle shedding on a bed by P. Gunderson) as well as using LPC/merge/tape. (MH, LW, PG, JLB)

- **TMR surface finish at Lap**:

REDACTED

PENGAD - Bayonne, N.J.
PETITIONER'S EXHIBIT
2

REDACTED

REDACTED

Seagate

Information, the way you want it *UPDATE,* [redacted]

TO: Lance Stover

FROM: Mehmet Hancer

SUBJECT: Advanced Slider Technology Weekly Highlights FW [redacted]

ACCOMPLISHMENTS / STATUS
CRITICAL ISSUES
IMPORTANT RESULTS / DATA
NEW FINDINGS / NEW PROJECTS

DETAILS

- **Hard Particle Cleaning**:

REDACTED

- **Slider Body Selective Encapsulation**: AlTiC coupons dip coating using tetraol for encapsulation is pending due to technician's workload apparently with PZT encapsulation project. We are negotiating to use technician for at least dip coating tests and use other technician from MEMS group to do e beam curing work separately.
  I have also ordered octadecyltrichlorosilane, OTS, (C18) from Sigma – Aldrich. Separate from tetroal work initiated by Lee Walter et all we will also test OTS chemistry for slider encapsulation for the first time. OTS may have several advantages over PFPE's (tetraol). We know controlling thickness of PFPE's can vary from 30 to 100A due to its long polymeric backbone structure. OTS on the other hand will make close packed dense film of max 30A (pretty much self limiting) due to shorter and straight chain individual OTS molecules. Another advantage is the fact that OTS does not require any curing. OTS is the choice of encapsulating agent for MEMS because of their superior tribological, thermal (500K-750 K) and chemical stability. The PFPE's are usually cured using e beam and UV treatment. As mention above OTS on the other hand, does not require curing but most importantly OTS film can selectively be degraded using UV. Photo generated O containing radicals (O, OH, O_3) is reported to contribute to OTS degradation. OTS adsorption onto surfaces takes place through the hydrolysis of the Si-Cl bonds to form Si-OH groups. All Si-Cl bonds become hydrolyzed as no chlorine detected following monolayer formation. The OH groups interact with OH groups on the oxidized surface, forming Si-O-Si bonds to the substrate through condensation reactions. The entire slider body may be encapsulated using OTS including ABS (or OTS on ABS can be etched away using UV). OTS may also eliminate the use of Seawax and perform better. Although seems promising the particle holding (prevent shedding) capability of these dense-packed OTS monolayers yet to be seen (MH).

- **TMR surface finish at Lap**:

REDACTED

/

REDACTED

Seagate

Information, the way you want it *UPDATE,*[redacted]

TO: Lance Stover

FROM: Mehmet Hancer

SUBJECT: Advanced Slider Technology Weekly Highlights FW[redacted]

ACCOMPLISHMENTS / STATUS

- **Hard Particle Cleaning**:

REDACTED

CRITICAL ISSUES
IMPORTANT RESULTS / DATA
NEW FINDINGS / NEW PROJECTS

DETAILS

- **Hard Particle Cleaning**:

REDACTED

PETITIONER'S EXHIBIT 4

PENGAD · Bayonne, N.J.

- **Slider Body Selective Encapsulation**: Since it has been more than three weeks we still waiting our encapsulant chemistries to be approved and part numbered. We think separate approval mechanisms needed for chemical requests to be used in development purposes. The development engineers who are dealing with sample sized chemicals should be able to order chemicals quickly fallowed by an MSDS approval by the EHS department (MH).

- **TMR surface finish at Lap**:

REDACTED

Seagate

Information, the way you want it ***UPDATE,*** [redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW**[redacted]

DETAILS

- **Slider Body Selective Encapsulation**: No activity since we are still waiting for the encapsulant chemistry (5 weeks). It seems we are almost there and Haas will order the chemicals this week from Sigma Aldrich. We have also ordered a specular reflectance FT/IR accessory for organic thin film characterization from Pike Technologies to characterize the SAM thin films on AlTiC, and DLC surfaces http://www.piketech.com/catalog/pdf_s/aga.pdf Recently question raised as to whether a monolayer of 15-30 A thin film can prevent 5000 A of particle shedding from slider surface?. Recently M. Huha has demonstrated preventing particle shedding from PZT by encapsulation using e beam cured 15 A PFPE thin films. Marsha even reports that a marginal level of particle reduction without e beam cure. Therefore it should be possible to have similar effect when sliders encapsulated using SAM's technology. SAM's, although does not require curing, make dense packed cross-linked monolayer films. An adsorbed monolayer of thin film can also prevent incoming particle adhesion and particle accumulations on certain part of slider surface. A strong monolayer of SAM adsorption onto Si, SiO_2, Al_2O_2, Si_3N_4, mica are well demonstrated in the literature. The OTS (SAM's we picked) may or may not adsorb onto DLC surface but if so it can easily be etched away using UV treatment. So that 4 or 5 faces of the slider can be encapsulated by a simple dip coating or CVD if necessary. Same SAM technology may also be used as protective head overcoat if ALD becomes a reality such as Al_2O_3 ALD. (MH)

- **TMR surface finish at Lap**:

REDACTED

- **Miscellaneous**:

REDACTED

PETITIONER'S EXHIBIT 5

PENGAD · Bayonne, N.J.

Seagate

Information, the way you want it

UPDATE, [redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW**[redacted]

<u>**DETAILS**</u>

- **Slider Body Selective Encapsulation**: This week we started encapsulating 0.5x0.5" AlTiC coupons using 5×10^{-4} M OTS SAM in cyclohexane solvent. Test coupons are cleaned in IPA acetone and DI water followed by 15 minutes of plasma cleaning to remove any organic contaminant on AlTiC surfaces. Tests will be done in a nitrogen purged environmental control chamber in order to better control moisture. Before dipping in cyclohexane, coupons will be exposed to moisture so that cross-linking between AlTiC and OTS molecules can be achieved. Different adsorption time (5, 10, 15 min) will be measured in order determine time to create one monolayer by FTIR specular reflectance accessory, which is expected to arrive early next week. After dip coating, coupons will be rinsed in chloroform solvent in order to remove excess OTS and dried at room temperature before tested for contact angle and FTIR tests.

- **TMR surface finish at Lap**:

  REDACTED

- **Miscellaneous**:

  REDACTED

Seagate

Information, the way you want it ***UPDATE,*** [redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW** [redacted]

DETAILS

- **Slider Body Selective Encapsulation**: The OTS (octedecyltrichlorosilane) concentration at $5x10^{-4}$ M OTS level found to be insufficient based on water contact angle data presented in Table below (around 72 degree). Therefore this week OTS concentration increased to $5x10^{-3}$ M. My previous experience with silicon substrate helped a lot to accelerate finding best film conditions. At this concentration two encapsulation (or reaction) time (5 and 10 minutes) studied and as low as 5 min.found to be sufficient to create a monolayer of OTS on bare AlTiC surface which gives a water contact angle of 100 plus degree (See Table below). FTIR, TEM and ellipsometry studies to further characterize film are also underway. Of equal significance from this week results is the fact that OTS film does not adsorbs (or adhere) to DLC (40 A by cathodic arc on AlTiC) surface based on water contact angle results by comparing before and after OTS adsorption. It should be noted that although OTS is self-limiting a proper rinsing after silanization reaction necessary to remove excess. We did in fact rinsed OTS monolayer three times with chloroform just to make sure OTS really adsorbs on surfaces and does not physically tackles during substrate withdrawal (or Langmuir transfer). So far results are promising and it seems OTS will likely to encapsulate AlTiC only, pretty much what we wanted to be. Water contact angle results also indicate that in fact OTS (105 degree) is better moisture barrier than DLC (51 degree) if OTS later used as protective overcoat coupled with ALD. Media lub (ZDOL) and OTS interaction studies is also underway, and media lub contact angle on OTS coated surface will be reported next week. We have also plan to demonstrate the particle shedding by doping particle on AlTiC coupons followed by OTS encapsulation using before and after wet sonic cleaning. We believe we, now, can start encapsulating actual slider sample and initiate drive/slider performance tests including media damage, particle shedding/accumulation, stiction, and HGA bond line glue/OTS interaction.
-

Table: Water contact angle (degree) on different surfaces at room temp.

Surface	On clean AlTiC	On $5x10^{-4}$ M OTS (or 0.02%)	On $5x10^{-3}$ M OTS (or 0.2%)	On DLC (new)	On DLC (Aged, a month)	0.2% OTS on DLC
WCA	<15	72	105	51	69	65

- **TMR surface finish at Lap**:

REDACTED

PENGAD • Bayonne, N.J.
PETITIONER'S EXHIBIT
7

Seagate

Information, the way you want it

UPDATE, [redacted]

REDACTED

Seagate

Information, the way you want it ***UPDATE,*** [redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW** [redacted]

DETAILS

- **Slider Body Selective Encapsulation**: Previously we have optimized the OTS reaction conditions (concentration, time). This week we have also measured the media lub (ZDOL a PFPE based lub) contact angles on OTS coated AlTiC surfaces in order to understand possible media lub/slider interactions in the presence of OTS. It is often reported an existence of media lub pick up at certain portion of slider body (steps, cavities). Media lub contact angle on Seawax coated AlTiC surfaces was reported to be 41 degree previously by Mark Jesh. Therefore it is expected that if coated with OTS, slider interaction (or lub pick up) with media lub will be diminished a little bit (or less wetting) since contact angles measured relatively bigger (53>41). This week we have encapsulated 0.5-micron alumina doped AlTiC coupons and waiting for LPC to compare OTS coated coupon's particle release with uncoated ones. We have also requested mercury AAB design SBR in order to start encapsulating sliders early in FW 45 for Seamerge, LPC, and HDI tests. (MH).
-

Table: Water contact angle (degree) on different surfaces at room temp.

Surface	On clean AlTiC	On $5x10^{-3}$ M OTS (or 0.2%)	On DLC (new)	On DLC (Aged, a month)
ZDOL	25	53	30	28

- **TMR surface finish at Lap**:

REDACTED

PETITIONER'S EXHIBIT 8

PENGAD · Bayonne, N.J.

Seagate

Information, the way you want it *UPDATE,*[redacted]

TO: **Lance Stover**

FROM: **Mehmet Hancer**

SUBJECT: **Advanced Slider Technology Weekly Highlights FW**[redacted]

DETAILS

- **Slider Body Selective Encapsulation**: This week Ellipsometry studies completed in order to understand film quality. AlTiC coupons coated with OTS (0.2% and 5 min. reaction time) under different reaction conditions. It is often reported in the literature that film quality is very much depends on the moisture or water available for strong crosslinkage. It should be noted that literature value for A is 28-30 and for n is 1.45-1.50. It is clear from the table below that a little bit of moisture helps making a monolayer and we will be using same reaction conditions throughout (middle in the table). (MH)
-

Reaction	Thick (A)	n (630nm)	k (630nm)
Dry Nitrogen purged	48	1.73	0.021
Left a beaker of water in the reaction chamber	26	1.36	0.029
Add 1000 ppm of water to reaction solvent	35	1.42	0.03

- **TMR surface finish at Lap**:

REDACTED

PENGAD - Bayonne, N.J.
PETITIONER'S EXHIBIT
9

KINNEY & LANGE

A PROFESSIONAL ASSOCIATION

PATENT, TRADEMARK,
COPYRIGHT, AND RELATED
INTELLECTUAL PROPERTY LAW

THE KINNEY & LANGE BUILDING
312 SOUTH THIRD STREET
MINNEAPOLIS, MINNESOTA 55415-1002

INFO@KINNEY.COM
FACSIMILE (612) 339-6580
TELEPHONE (612) 339-1863
GAYLE A. BUSH
Direct (612) 337-7239
gabush@kinney.com

[redacted]

Paul T. Dietz, Esq.
Seagate Technology, LLC.
NRW 097
7801 Computer Avenue South
Bloomington, MN 55435

Re: U.S. Continuation-in-Part Patent Application of Marsha A. Huha et al.
(Serial No. 10/409,385)
Title : ENCAPSULANT FOR MICROACTUATOR SUSPENSION
Our File : I69.12-0621
Your File : STL 11242.10

Dear Paul:

This letter is to confirm our conversation earlier today, in which you requested that I prepare a continuation-in-part application for U.S. Patent Application Serial No. 10/409,385, entitled Encapsulant for Microactuator Suspension. Our records indicate that the Seagate file no. for this matter should be 11242.10. If this number is incorrect, please forward me the correct Seagate file number. In addition, could you please forward an information disclosure form that includes the full name, address, and citizenship country for each inventor of the invention for the above-identified matter.

Thank you for requesting my assistance in preparing this patent application. In the meantime, if you have any questions, do not hesitate to contact me.

Very truly yours,

Gayle A Bush

Gayle A. Bush

GAB:amh

PENGAD · Bayonne, N.J.
PETITIONER'S EXHIBIT
10

Gayle Bush

From: Jackie.M.Stadt@seagate.com
Sent: [redacted]
To: gabush@kinney.com
Subject: STL 11242.10 / Your Ref. No. I69.12-621

Dear Gayle,

I am in receipt of your letter addressed to Paul Dietz dated [redacted] regarding the above-identified case, thank you. You request information regarding the inventors. The three inventors for the Utility will remain
the same on this CIP. We are adding inventor Mehmet Hancer on the CIP. His information is as follows:

Name: Mehmet Hancer
Citizenship: Turkish
Residence Address: 1939 Covington Lane, Eagan, MN 55122
Seagate Mail Stop: NRW 131
E-mail: mehmet.hancer@seagate.com

Thank you for your assistance.

Best regards,

Jackie Stadt
Senior Legal Secretary
Seagate Technology LLC
Intellectual Property Department
7801 Computer Avenue So.
Bloomington, MN 55435
Phone: (952) 402-7683
Fax: (952) 402-8187
jackie.m.stadt@seagate.com

Disclosure

Gayle Bush

From: Mehmet.Hancer@seagate.com
Sent: [redacted]
To: gabush@Kinney.com
Cc: Paul.T.Dietz@seagate.com
Subject: SAM inclusion

Hi Gayle
here is the info for inclusion in the previous disclosure by Marsha Huha and Lee Walter closure 11185. Please do not hesitate to ask me for any clarification addition
regards
have a nice weekend

mehmet 952 4027737

Self assembled monolayers (or SAMs) of thin organic films such as alkyl and
perfluoroalkyl-trichlorosilane, octadecyltrichlorosilane (OTS), dichlorosilane, alkene, alkyl(ethoxy) silanes may also be considered as encapsulating chemistries for slider/actuator particle entrapment methods.
The ultamate advantage of using these chemistries is the fact that they do
not require curing (e.g., electron beam) and that the thickness of the resulting films is self limiting to a one layer of molecule. Furthermore,
densed packed molecules of these chemistries naturally crosslink (or stick)
to an AlTiC substrate (which head/slider material is made of) and themselves making it an excellent thin barrier film against moisture (like
teflon), particle shedding, and media lubricant pick-up. Above chemistries
preferentially stick only to AlTiC surface and not onto diamond like carbon
(or DLC) surfaces making it an excellent candidate for slider body coating
without creating head media separation problems. The coating can be done both in liquid and gas media.

- selective
- no curing

Some of the target usage of these chemistries includes

Ø Prevent incoming particle accumulation/adhesion/agglomeration on slider/actuator surfaces
Ø Prevent particle shedding from AlTiC/Actuator grains due to contact
events including load and unload, at the edges, corners, and surfaces
Ø Mitigate lub pick up from media for heads
Ø Improved flyability of heads with reduced stiction/friction

Gayle Bush

<gabush@Kinney.co To:
"'Mehmet.Hancer@seagate.com'" <Mehmet.Hancer@seagate.com>

m> cc:

No Phone Info Subject: RE: test

Available

[redacted]

Thank you Mehmet.

Gayle Bush
Kinney & Lange, P.A.
312 South Third Street
Minneapolis, MN 55415
P: (612) 337-7239
F: (612) 339-6580
gabush@kinney.com

-----Original Message-----
From: Mehmet.Hancer@seagate.com [mailto:Mehmet.Hancer@seagate.com]
Sent: [redacted]
To: gabush@kinney.com
Subject: test

Hi Gayle
just sending this e mail for your address conformation, info regarding
OTS
will be ready before tuesday
regards,
mehmet hancer

****
Sr. Advisory Dev. Eng.
Seagate Technology
Mailstop NRW130
7801 Computer Ave. South
Bloomington, MN 55435
Ph: 952 - 402 7737
****

Gayle Bush

From: Mehmet.Hancer@seagate.com
Sent: [redacted]
To: gabush@Kinney.com
Subject: OTS disclosure/Seagate

pic28692.pcx

Hi Gayle:
Here is the additional info requested. Let me know How does it look like and address your questions.??
regards
mehmet

Some of the Organosilicone (or Organosilane) chemistries includes: Octadecyltrichlorosilane, octadecyldimethylchlorosilane, butyltrichlorosilane, perfluorodecyltrichlorosilane, alkylsiloxane, dichlorosilane, alkene and alkyl ethoxy silanes, octadecyltriethoxysilane, alkylaminosilanes, alkanethiols, in addition to these organosilanes, n-octadecene, should also be included (althougth it is not an organosilane). Some of the solvents that can be used to dissolve these chemistries includes alkenes such as n-Hexane, n-Cylohexane, Aromatic Hydrocarbons such as Toluene, Halogen Compounds such as Chloroform, and branched hydrocarbon solvents. Film coating can be accamplished by immersing sliders into these solvents containing the above chemistries (dip coating) or exposing the substrates to the vapor of the above chemistries, (process is then called chemical vapor deposition or CVD) . Silanization of a substrate (PZT/Slider) begins with the hydrolysis of polar head group which turns the Si-Cl bonds to Si-OH groups. And then these groups attaches to a ceramic oxide surface (PZT/Slider) reacting with Si-OH (or silanol) leaving the surface with very low energy (water contact angles of greater than 110 degree) hydrocarbon tail as shown in Figure below. Process does not require curing but some sort of heat annealing at temperatures between 100 and 200 oC gives better coating quality.

(Embedded image moved to file: pic28692.pcx)

Figure: Front view of an computer hard disk slider (ABS up) coated by an self assembled monolayer thin film

PENGAD · Bayonne, N.J.
PETITIONER'S EXHIBIT
13

please
contact the sender by reply e-mail and destroy all copies of the
original
message.

Gayle Bush

From: Mehmet.Hancer@seagate.com
Sent: [redacted]
To: gabush@Kinney.com
Subject: RE: OTS disclosure/Seagate [redacted]

Hi Gayle:

Non encapsulated slider surface is nothing but AlTiC (short for mixture of Al2O3 + TiC) material. AlTiC being as high energy surface, incoming (or the particles exist in the hard disk) high energy particles, moisture, and lubricant from media (spinning disk where data read and written) surface easily adhere (or adsorb) on to slider surface. By coating or encapsulating slider AlTiC portion, we selectively lower the surface energy of AlTiC making it less amenable for external disturbances such as external particles, contaminants, moisture: it is a kind of sealing event. These are external forces but film is also design to keep the internal particles to shed or release during operation (i.e.,during contact events). AlTiC material interestingly has granular structure of appr. 0.5 micron size of each (meaning each Al2O3 and TiC). Due to this composite structure it has the tendency to release particles from its grains due to shock, and contact event causing drives to crash or fail while slider runs over a particle running with high speed. The self assembled film accually seals the slider by filling the cracks and gaps. It reduces the shedding and at the same time creates softer edges, corners and surfaces which again prevent particle shedding from same grains creating "cushion" like structure. Since film has very low surface energy it also works like a lubrication layer making it sliders fly better over media with improved stiction and friction on the air bearing surface or the surface which sees media.

shedding

As far as the head media separation, we know non-encapsulated sliders does not cause head media separation but I meant there that encapsulated sliders also do not cause head media separation problems. Because being selective film does not adhere to DLC (diamond like carbon) coating which I have illustrated in my previous drawing. Accually we do not want any extra coating on this DLC layer because it causes extra more space which increase the distance between the slider and media (that is head media separation) .

We want slider surface as close as possible to media so that slider can better read from and write to media. In summary encapsulated sliders does not cause head media separation problems because film does not adhere to DLC.

let me know any of the above is not clear, thanks
regards
mehmet

Gayle Bush

<gabush@Kinney.co To:
"'Mehmet.Hancer@seagate.com'" <Mehmet.Hancer@seagate.com>

m> cc:

No Phone Info Subject: RE: OTS
disclosure/Seagate
Available

[redacted]

Mehmet,
Thank you for the previous information you had sent me. I have another question for you. How does a non-encapsulated slider cause the problems detailed in your [redacted] email, such as head media separation, incoming particle accumulation, particle shedding, and flyability.

Thank you,
Gayle Bush

Kinney & Lange, P.A.
312 South Third Street
Minneapolis, MN 55415
P: (612) 337-7239
F: (612) 339-6580
gabush@kinney.com